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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/534,199

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EXAMINER

SMITH, BRADLEY

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/534,199	Applicant(s) ASPAR ET AL.	
	Examiner Bradley K. Smith	Art Unit 2894	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 5/19/09.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>5/19/09</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 2, 5, 8-12, 14-18, and 21- 23 are rejected under 35 U.S.C. 102(b) as being anticipated by Agarwal et al. (Efficient production of silicon on insulator films by co-implantation of He^+ with H^+) (cited by applicant 5/6/05). Regarding 1, 17, and 23 Agarwal et al. disclose a) implanting a first chemical species (H)($7.5 \times 10^{-15} \text{ cm}^{-2}$) in the substrate at a first depth (implanted at 30 kev) at least one b) implanting at least one second chemical species (He) ($1.0 \times 10^{-16} \text{ cm}^{-2}$) in the substrate at a second depth (implanted at 33 kev)(*See examiner's note below) different from said first depth and at an atomic concentration higher than the atomic concentration of the said first chemical species [2nd column p. 1086], wherein said at least one second chemical species is less effective than said first chemical species at weakening the substrate, and wherein said steps a) and b) can be executed in either order (inherent), c) diffusing at least a portion of said at least one second chemical species (p1087 second column disclose the helium diffusing) from said second depth up to the vicinity of said first (annealing for 20 min at 450 deg C or 20 sec at 750 deg C), and d) initiating said fracture(shear and transfer) [abstract] along said first depth (p. 1087 2nd column) discloses that the hydrogen immediately forms defects). Regarding claim 2, the first chemical species Hydrogen implanted at 30 kev with be at

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a greater depth than the helium implanted at 33 keV (as disclosed in the examiner's note below). Agarwal discloses. Regarding claims 5 and 10, Agarwal discloses furnace anneal (p.1086 2nd column). Regarding claims 8, 9, 21 and 22, Agarwal discloses annealing for 20 min at 450 deg C or 20 sec at 750 deg C (which is less than 300 degrees for several days as disclosed in [0075], further all of the helium is considered an "additional amount"). Regarding claims 11 and 12, Agarwal et al. disclose shear a transfer of the thin silicon film (the examiner understands this to mean a shear stress is applied to the wafer to separate the thin silicon layer). Regarding claim 14, Agarwal discloses a handle support (p. 1086 2nd column) applied to the substrate. Regarding claim 15, Agarwal et al. disclose the first species is hydrogen (title). Regarding claim 16, Agarwal et al. disclose second species is helium (He) (title). Regarding claim 18, Agarwal discloses support (handle) (p. 1086 2nd column) underlying the thin layer.

Examiner's Note: the examiner understands that both the hydrogen and the helium would be at different depths. As evidence, the examiner is providing the review article "Hydrogen blistering of silicon: Progress in fundamental understanding" page 2164 discloses that helium implanted at 32 keV will have 2/3 the depth of a hydrogen implant at 32 keV and p 2165 discloses "with H (30keV) implanted deeper and He (33keV) implanted shallower". Therefore the examiner understands that He implanted at 33 keV would be at a lower depth than hydrogen implanted at 30 keV.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

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having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Agarwal et al. in view of Weldon et al. (“Mechanism of silicon exfoliation induced by hydrogen/helium co-implantation”) and Wang. Agarwal disclose a) implanting a first chemical species (H)($7.5 \times 10^{-15} \text{ cm}^{-2}$) in the substrate at a first depth at least one b) implanting at least one second chemical species (He) ($1.0 \times 10^{-16} \text{ cm}^{-2}$) in the substrate at a second depth different from said first depth and at an atomic concentration higher than the atomic concentration of the said first chemical species [2nd column p 1086]wherein said at least one second chemical species is less effective than said first chemical species at weakening the substrate, and wherein said steps a) and b) can be executed in either order (inherent), c) diffusing at least a portion of said at least one second chemical species from said second depth up to the vicinity of said first, and d) initiating said fracture along said first depth.

Agarwal does not disclose the second species implanted at a depth greater than the first depth.

However Weldon disclose implanting deeper than the first implant (p. 3721 second column).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Agarwal and Weldon because controlling the implant depth/energy is well known in the art (Wang (US Patent 4,956,698)).

Claims 4 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Agarwal et al. in view of Duo et al. ("Comparison between the different implantation orders in H⁺ and He⁺ coimplantation").

Agarwal et al. disclose a) implanting a first chemical species (H)($7.5 \times 10^{-15} \text{ cm}^{-2}$) in the substrate at a first depth (implanted at 30 kev) at least one b) implanting at least one second chemical species (He) ($1.0 \times 10^{-16} \text{ cm}^{-2}$) in the substrate at a second depth (implanted at 33 kev)(
*See examiner's note above) different from said first depth and at an atomic concentration higher than the atomic concentration of the said first chemical species [2nd column p. 1086], wherein said at least one second chemical species is less effective than said first chemical species at weakening the substrate, and wherein said steps a) and b) can be executed in either order (inherent), c) diffusing at least a portion of said at least one second chemical species (p1087 second column disclose the helium diffusing) from said second depth up to the vicinity of said first (annealing), and d) initiating said fracture(shear and transfer) [abstract] along said first depth (p. 1087 2nd column) discloses that the hydrogen immediately forms defects). Regarding claim 2, the first chemical species Hydrogen implanted at 30 kev with be at a greater depth that the helium implanted at 33 kev (as disclosed in the examiner's note above).

Agarwal fails to disclose that second species implanted before the first species would result in exfoliation.

However, Duo et al. disclose that the synergistic effect of hydrogen and helium implantation is observed when combined in different orders (p 482, 2nd column).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Agarwal and Duo because the synergistic effect still exist regardless of the ion implantation order [Duo (p 482, 2nd column)].

Claims 6, 7, 13, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Agarwal et al. in view of Misubishi (JP 11087668).

Agarwal et al. disclose a) implanting a first chemical species (H)($7.5 \times 10^{-15} \text{ cm}^{-2}$) in the substrate at a first depth at least one b) implanting at least one second chemical species (He) ($1.0 \times 10^{-16} \text{ cm}^{-2}$) in the substrate at a second depth different from said first depth and at an atomic concentration higher than the atomic concentration of the said first chemical species [2nd column p. 1086], wherein said at least one second chemical species is less effective than said first chemical species at weakening the substrate, and wherein said steps a) and b) can be executed in either order (inherent), c) diffusing at least a portion of said at least one second chemical species (p1087 second column disclose the helium diffusing) from said second depth up to the vicinity of said first (annealing), and d) initiating said fracture(shear and transfer) [abstract] along said first depth (p. 1087 2nd column) discloses that the hydrogen immediately forms defects).

Agarwal fails to disclose initiating said fracture further comprises applying a heat treatment, the diffusing and initiation occur simultaneously, and initiating said fracture, a thickener is applied to the said substrate to serve as a support for said thin layer after said fracture of said thin layer from the said substrate (fig. 2).

However regarding claim 6, Mitsubishi disclose said initiating said fracture further comprises applying a heat treatment [0021]. Regarding claim 7 and 20, Mitsubishi disclose the

diffusing and initiation occur simultaneously [0021]. Regarding claim 13, Mitsubishi disclose during initiating said fracture, a thickener is applied to the said substrate to serve as a support for said thin layer after said fracture of said thin layer from the said substrate (fig. 2).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Agarwal et al. and Mitsubishi because fracturing the film from the wafer would release the silicon film and enable one to bond the silicon film onto another wafer.

Response to Arguments

Applicant's arguments with respect to claims 1-23 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Bradley K. Smith whose telephone number is 571-272-1884. The examiner can normally be reached on 10-6.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kim Nguyen can be reached on 571-272-2402. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Bradley K Smith/
Primary Examiner, Art Unit 2894